

Fishes of the St. Johns River, Florida

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THE St. Johns River watershed has an area of approximately 8,350 square miles. The headwaters are about 50 miles north of Lake Okeechobee and 15 miles inland from Florida's east coast. From there, the river flows northward 260 miles to the vicinity of Jacksonville, and then swings eastward for about 25 miles before emptying into the Atlantic Ocean. Tidal influence extends as far upstream as Lake George, 115 miles above the mouth. Salinity varies greatly in the lower reaches, but south of Jacksonville it is normally less than 1 o/oo.

This system is of particular interest because of the extent to which marine forms penetrate the strictly fresh waters in the river's upper reaches. Such fishes as *Archosargus probatocephalus*, *Sciaenops ocellata*, *Micropogon undulatus*, *Pogonias cromis*, *Lutjanus griseus*, and *Dasyatis* sp. have been found far upstream. As a result, the so-called primary-division freshwater fishes, i.e., those fishes that are intolerant of salt water (Myers, 1938, 1951), often occur together with various marine species.

The St. Johns estuary is a nursery area for the young of many marine fishes that spawn in the ocean, and also is a feeding and spawning area for various adult marine fish. Spawning populations in the river consist of species that are anadromous, those that extend their breeding range into the river, and some that have established isolated resident populations in the fresh water.

The abundance of marine fishes beyond the zone of brackish water (salinity of 5 o/oo or less) probably is due to the configuration of the river and to the presence of moderate traces of salt in its upper reaches. Many tributary creeks and large coves along the lower 25 miles of river provide areas of intermediate salinity where fish can undergo gradual transition from salt to fresh water. Odum (1953) stated that the main reasons for the extensive movement of marine forms into the St. Johns system appear to be the abundance of calcium chloride in the water and the presence of the salt springs that drain into the river. Salinity actually increases with distance upstream between Palatka and Lake George from the discharge of a number of these springs (Beck, 1965).

The boundary between brackish and fresh water, which moves

back and forth from its usual location in southern Jacksonville, determines the upstream or downstream penetration of many species. The following selected salinity readings indicate the effect of tidal stage and runoff on the vertical and horizontal location of brackish waters. In October, at low tide, salinity in the channel, 29 miles upstream, was 0 o/oo at the surface and 4.6 o/oo at the bottom; at high tide, it was 10.2 o/oo at the surface and 10.9 o/oo at the bottom. Salinity on the channel bottom normally is greater than that at the surface. Freshwater fishes rarely occur downstream of the boundary between brackish and fresh water, and, conversely, marine forms that cannot tolerate fresh water seldom occur upstream of the boundary. For example, *Ictalurus catus* and *I. punctatus* were the only freshwater forms collected at salinities above 1 o/oo (up to 9 o/oo).

The abundance and size of many fishes changes seasonally with temperature. Gunter (1945) stated that the temperature cycle was more definite than general salinity changes and was chiefly responsible for the seasonal movements and other recurrent activities of marine fishes in Texas. The occurrence in the St. Johns of marine forms that reach the northern or southern limit of their ranges off northeast Florida is particularly dependent on favorable seasonal temperatures.

Various scientists have contributed to knowledge of the fish fauna of the St. Johns River, particularly since the turn of the century. The first comprehensive checklist of Florida fishes included 112 species from the St. Johns, of which 28 were found only at the mouth (Evermann and Kendall, 1900). Fowler (1945) included a number of records from the system in his study of fishes of the southern Piedmont and Coastal Plain. The most extensive study was a 10-year investigation by McLane (1955), who provided an annotated list of the species known to occur in the St. Johns drainage, but excluded those forms found only near the mouth. Of the 118 forms he reported, 52 are strictly freshwater species. Some of McLane's data (collected in 1953) were from a long-term study of the exploited fish populations of the river (Moody, 1961). Carr and Goin (1959) reported the occurrence of certain marine species in the St. Johns in their guide to the freshwater fishes of Florida. Briggs (1958) summarized the ranges of St. Johns River fishes in his checklist of Florida species.

From April 1961 to November 1963, the seasonal occurrence of fishes in trawl and seine collections was noted during a study of the blue crab (*Callinectes sapidus*) in the St. Johns River by the Bureau of Commercial Fisheries. Capture of fish was incidental to the "random" or regular sampling of juvenile crabs. The number and size range of many of the fish collected from 10 to 135 miles upstream were summarized and a complete checklist was prepared.

A 70-foot seine having a funnel-shaped bag 15 feet long (net, $\frac{3}{8}$ -inch, and bag, $\frac{5}{32}$ -inch stretched mesh) and an 8-foot trawl (net, $\frac{1}{2}$ -inch, and bag, $\frac{1}{4}$ -inch stretched mesh) were used to obtain nearly all of the fish. Specimens of *Sphyrna lewini* were obtained from commercial fishermen.

At the time of each collection we determined surface salinity in parts per thousand (hydrometer readings corrected for temperature) and surface water temperature in degrees centigrade. All salinity readings beyond 30 miles upstream were less than 1 o/oo and were recorded as 0 o/oo.

Specimens in each sample were identified, counted, and measured in the field. Representative individuals from almost all collections were preserved in 10 per cent formalin and sent to the Florida State Museum, Gainesville, Fla., for identification and inclusion in its collection of fishes. Lengths of fishes with forked tails were measured from the tip of the snout to the caudal fork; those with nonforked tails were measured to the tip of the longest caudal ray. Fork lengths were taken in preference to other measurements because of the ease and speed with which they could be obtained.

COLLECTING LOCALITIES

Collections were obtained from 12 localities or stations that were assigned letters from A to L according to distance upstream (Fig. 1). Fish from tributary streams (stations A, C, E, and F) were captured 1 to 3 miles from the mouth of the tributary. Specimens from the main river and from Lake George (stations B, D, and G to L) were taken in the channel and adjacent waters.

The various stations represented different types of habitat. The bottom material at stations C, E, and F was muck; at all others it was firmer mud and sand. Bottom vegetation was most dense at stations H and I where it consisted of coontail-moss (*Ceratophyllum*

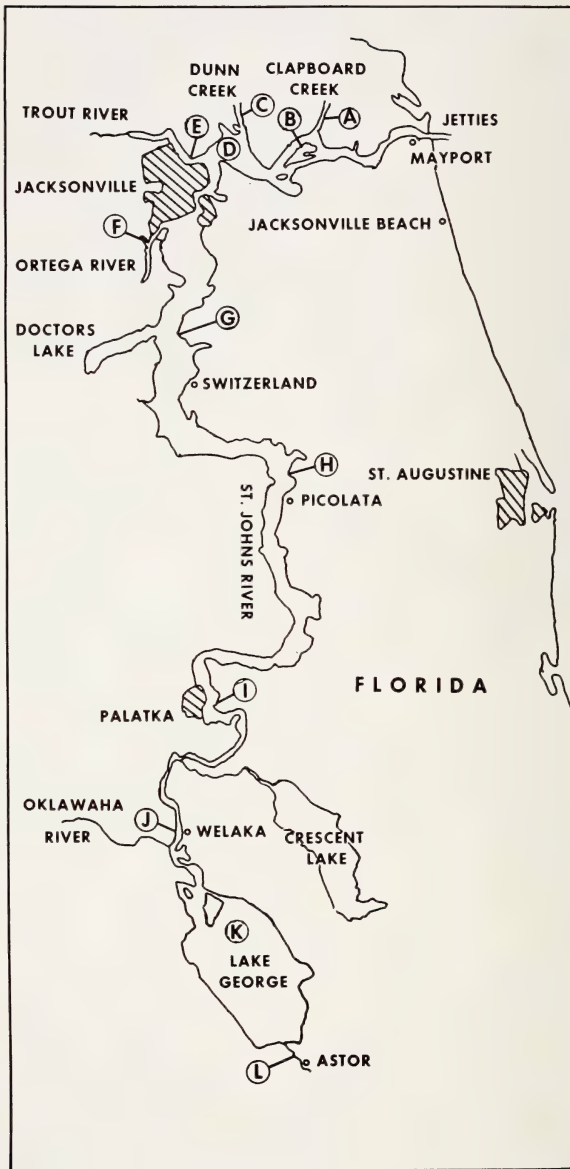


Fig. 1. Location of the 12 collecting stations, A to L, in the St. Johns River.

sp.) and eelgrass (*Vallisneria* sp.). The maximum depths were 6 feet at station C, 11 feet at F and K, and more than 20 feet at all other stations.

The following is a complete list of collections, numbered consecutively by station and date. Data for each station are given in the order: year, collection number (in parentheses), month and day, surface salinity (o/oo) and surface temperature ($^{\circ}$ C). Salinity is omitted for stations G to L, where all readings were 0 o/oo.

Station A (10 miles upstream).

- 1961: (1) April 18—14.6, 20.0; (2) May 17—27.3, 25.2;
 (3) June 7—21.5, 28.8
 1962: (4) Mar. 13—28.2, 17.4; (5) Mar. 29—20.8, 21.5
 (6) Apr. 9—25.8, 19.3; (7) Sept. 19—15.8, 30.0
 1963: (8) Feb. 14—7.7, 11.0; (9) Feb. 20—10.8, 13.0;
 (10) Mar. 5—9.5, 19.0; (11) Mar. 21—11.4, 18.5;
 (12) Apr. 9—22.1, 21.3; (13) Apr. 22—19.5, 27.0;
 (14) Apr. 23—15.4, 23.5; (15) May 7—26.8, 23.5;
 (16) May 22—23.1, 27.0; (17) June 5—24.7, 26.6;
 (18) June 18—22.5, 28.7; (19) July 3—14.5, 27.4;
 (20) July 23—14.5, 29.2; (21) Aug. 13—15.8, 29.8;
 (22) Aug. 26—20.1, 29.5; (23) Aug. 27—25.2, 28.7;
 (24) Sept. 30—10.3, 24.0; (25) Oct. 4—7.9, 26.2;
 (26) Nov. 18—13.1, 17.4;

Station B (13 miles upstream)

- 1962: (1) Mar. 13—28.0, 17.0; (2) May 15—30.2, 26.5;
 (3) June 6—23.7, 28.5; (4) Aug. 6—14.1, 30.1;
 (5) Sept. 6—16.0, 28.3; (6) Sept. 19—15.8, 30.0
 1963: (7) July 23—19.6, 30.0

Station C (20 miles upstream)

- 1961: (1) Oct. 24—13.4, 22.2; (2) Nov. 20—13.7, 20.3;
 (3) Dec. 19—9.0, 19.8
 1962: (4) Jan. 15—24.5, 12.8; (5) Feb. 19—22.2, 18.5;
 (6) Mar. 29—18.0, 21.5; (7) Apr. 9—20.0, 23.5;
 (8) May 25—25.0, 29.5; (9) June 14—19.9, 29.2;
 (10) July 12—17.5, 31.4; (11) Aug. 10—0, 30.6;
 (12) Aug. 16—14.0, 31.0; (13) Aug. 30—13.7, 30.8;
 (14) Sept. 17—10.2, 29.1; (15) Oct. 24—11.1, 21.0;
 (16) Nov. 19—8.8, 18.0; (17) Dec. 17—12.0, 12.0;
 (18) Dec. 18—10.3, 13.0
 1963: (19) Jan. 17—6.9, 14.0; (20) Feb. 14—1.7, 10.5;
 (21) Mar. 4—0, 17.5; (22) Mar. 7—0, 16.8;
 (23) Mar. 18—5.2, 21.0; (24) Mar. 19—3.9, 25.7;
 (25) Apr. 10—10.5, 21.5; (26) Apr. 23—6.7, 23.0;
 (27) May 8—21.3, 24.0; (28) May 21—16.6, 26.2;
 (29) June 4—22.7, 26.4; (30) June 17—10.3, 28.5;

- (31) July 2—0, 27.5; (32) July 23—5.8, 29.1;
 (33) Aug. 13—13.3, 31.0; (34) Aug. 26—7.6, 31.5;
 (35) Sept. 9—4.0, 28.5; (36) Sept. 30—0, 25.4;
 (37) Oct. 8—0, 24.1; (38) Oct. 18—1.0, 23.0;
 (39) Nov. 19—2.5, 20.0

Station D (22 miles upstream)

- 1961: (1) Aug. 16—24.5, 29.0
 1962: (2) May 29—13.7, 29.7
 1963: (3) Jan. 29—18.3, 11.7

Station E (25 miles upstream)

- 1961: (1) Apr. 18—5.7, 21.0; (2) May 9—11.3, 24.8;
 (3) June 7—14.3, 30.8; (4) Aug. 16—13.5, 28.2;
 (5) Oct. 24—9.5, 22.0; (6) Nov. 20—8.8, 20.5;
 (7) Dec. 19—10.0, 20.5
 1962: (8) Jan. 15—17.8, 14.0; (9) Feb. 19—19.0, 21.2;
 (10) Mar. 29—16.9, 18.5; (11) May 25—22.1, 33.8;
 (12) June 14—14.9, 29.9; (13) July 12—15.3, 34.1;
 (14) July 27—11.0, 30.0; (15) Aug. 10—0, 32.6;
 (16) Aug. 16—9.0, 31.8; (17) Sept. 17—8.4, 30.8;
 (18) Oct. 24—8.0, 21.0; (19) Nov. 19—5.5, 19.4;
 (20) Dec. 17—10.8, 11.0
 1963: (21) Jan. 17—5.2, 13.0; (22) Mar. 6—2.0, 19.5;
 (23) Mar. 20—3.0, 23.5; (24) Apr. 8—13.9, 20.3;
 (25) Apr. 24—6.6, 24.3; (26) May 6—17.9, 22.8;
 (27) May 20—14.9, 27.0; (28) June 3—22.1, 26.7;
 (29) June 19—11.9, 29.1; (30) July 1—0, 29.8;
 (31) July 16—10.5, 30.2; (32) July 24—8.6, 29.3;
 (33) Aug. 14—12.2, 29.8; (34) Aug. 27—9.0, 31.0;
 (35) Oct. 1—6.2, 24.8; (36) Oct. 9—0, 25.3;
 (37) Nov. 20—2.2, 16.5

Station F (30 miles upstream)

- 1962: (1) May 29—11.9, 32.4

Station G (40 miles upstream)

- 1961: (1) Apr. 17—20.0; (2) May 8—25.5; (3) June 19—25.0

Station H (60 miles upstream)

- 1961: (1) Apr. 17—21.0; (2) Apr. 19—21.0; (3) May 8—25.5;
 (4) June 16—29.0; (5) Aug. 25—29.5; (6) Oct. 23—24.5;
 (7) Nov. 21—20.0; (8) Dec. 13—20.2
 1962: (9) Jan. 19—12.0; (10) Feb. 21—19.0; (11) Mar. 28—20.5;
 (12) Apr. 20—21.2; (13) May 14—26.8; (14) June 13—28.0;
 (15) July 17—29.0; (16) July 30—29.3; (17) Aug. 7—30.5;
 (18) Aug. 13—31.6; (19) Aug. 15—34.0; (20) Sept. 14—31.0;
 (21) Oct. 19—24.1; (22) Nov. 20—17.7; (23) Dec. 14—8.3
 1963: (24) Jan. 23—14.0; (25) Feb. 13—13.0; (26) Mar. 12—20.0;
 (27) Mar. 25—20.0; (28) Apr. 11—22.2; (29) Apr. 26—23.8;
 (30) May 9—25.0; (31) May 23—28.0; (32) June 14—28.9;
 (33) June 24—28.8; (34) July 11—28.4; (35) July 29—29.5;

- (36) Aug. 12—30.0; (37) Aug. 28—29.8; (38) Sept. 16—26.0;
 (39) Oct. 2—24.5; (40) Oct. 10—23.5; (41) Nov. 21—16.6

Station I (84 miles upstream)

- 1961: (1) Apr. 20—21.5; (2) May 11—19.0; (3) June 8—29.0;
 (4) Aug. 29—28.8; (5) Oct. 12—25.2; (6) Nov. 28—20.8;
 (7) Dec. 12—21.1
 1962: (8) Jan. 16—12.9; (9) Feb. 12—16.0; (10) Mar. 28—19.7;
 (11) Apr. 25—25.8; (12) May 28—30.2; (13) June 13—32.8;
 (14) July 30—33.5; (15) Aug. 17—30.0; (16) Sept. 18—29.7;
 (17) Sept. 26—30.0; (18) Oct. 12—27.4; (19) Nov. 21—19.0;
 (20) Dec. 14—8.8
 1963: (21) Jan. 23—15.5

Station J (105 miles upstream)

- 1961: (1) May 11—22.0; (2) June 22—26.0; (3) Oct. 17—23.0;
 (4) Nov. 23—19.9; (5) Dec. 21—17.8
 1962: (6) Jan. 12—12.0; (7) Feb. 15—20.5; (8) Dec. 19—12.2

Station K (120 miles upstream)

- 1961: (1) Apr. 21—20.5; (2) May 12—23.8; (3) June 20—26.5;
 (4) July 10—29.0
 1962: (5) May 23—29.0

Station L (135 miles upstream)

- 1961: (1) Apr. 21—21.0; (2) May 12—28.5; (3) June 20—26.8

FISHES

The fish fauna of the St. Johns River consists of 55 species that are typical freshwater forms and 115 that are euryhaline (occur both in sea water and water of moderate to zero salinity). One species, *Cyprinodon hubbsi*, is endemic to the river system. Families particularly well represented are Clupeidae, Cyprinodontidae, Centrarchidae, Sciaenidae, and Gobiidae.

The list of marine fish for the St. Johns would be longer if fish collected in the river within a few miles of the mouth had been included. In this category, I collected *Anchoa lyolepis* (dusky anchovy), *Hippocampus erectus* (spotted seahorse), *Pomatomus saltatrix* (bluefish), and *Sphaeroides spengleri* (bandtail puffer).

The following list is a taxonomic grouping of all records of fish for the St. Johns known to me, 170 species representing 55 families. This listing is primarily based on 116 species reported by McLane (1955) and 51 records from the present study. The changes that were made in the records given by McLane are: *Notropis* sp. to *N. welaka*, *Ogcocephalus* sp. to *O. cubifrons*, *Ictalurus platycephalus* to *I. brunneus* (validated by Dr. Ralph Yerger, Florida State Uni-

versity) and deletion of *Alosa pseudoharengus* (a 19th-century record considered in error). The checklist also contains *Paralichthys albigutta* (reported in Carr and Goin, 1959), and, from specimens in the Florida State Museum collection, *Elassoma okefenokee* and *Umbra pygmaea*. Nomenclature follows that of Bailey, Lachner, Lindsey, Robins, Roedel, Scott, and Woods (1960).

For each of the 101 euryhaline species collected in the present study, I have included a summary of the stations (collection number in parentheses) at which it was taken, the ranges in surface salinity and temperature when collected, and number and length range of fish, by month. Salinity is in parts per thousand, water temperature in degrees C, and length (FL) in mm. Some specimens were not identified to species and are listed as undetermined, by genus or family. In addition to *Anchoa hepsetus* and *A. mitchilli*, one other engraulid (of uncertain identity) was collected and is referred to as *Anchoa* sp. Fourteen euryhaline species, those reported for the river but not obtained in this study, are listed with the notation "None captured."

Entered without annotation are the 55 species that are confined to fresh water (indicated by an F). Except for an adult specimen of *Eleotris picta* captured at station H on August 13, 1962 (first record of occurrence in the river) my samples of strictly freshwater forms provided little new information.

Fifty-one species not previously recorded are designated by an asterisk.

Family PETROMYZONTIDAE

Petromyzon marinus Linnaeus. Sea lamprey. None captured.

Family SPHYRNIDAE

Sphyrna lewini (Griffith and Smith). Scalloped hammerhead*. Station: B(3). Salinity 23.7, temperature 28.5. Number and length: June (2, 324-381).

Family DASYATIDAE

Dasyatis americana Hildebrand and Schroeder. Southern stingray. None captured.

Dasyatis sabina (Lesueur). Atlantic stingray. Stations: A(6),

B(6, 17, 20), C(7), D(1), E(37), H(12, 16, 22, 38), I(8, 9, 13, 16, 18-21), J(3-6, 8). Salinity 0-25.8, temperature 8.8-32.8. Number and length: Jan. (5, 495-635); Feb. (3, 478-533); Apr. (3, 533-711); June (2, 508-521); July (2, 394-660); Aug. (2, 330-700); Sept. (2, 310-432); Oct. (2, 500-508); Nov. (5, 381-711); Dec. (8, 432-648).

Family ACIPENSERIDAE

Acipenser brevirostrum Lesueur. Shortnose sturgeon. None captured.

Acipenser oxyrhynchus Mitchill. Atlantic sturgeon. None captured.

Family LEPISOSTEIDAE

Lepisosteus osseus (Linnaeus). Longnose gar. F

Lepisosteus platyrhincus DeKay. Florida gar. F

Family AMIIDAE

Amia calva Linnaeus. Bowfin. F

Family ELOPIDAE

Elops saurus Linnaeus. Ladyfish. Stations: A(25), C(33), E(20, 37), H(17), I(12). Salinity 0-13.3, temperature 11.0-31.0. Number and length: May (1, 51); Aug. (3, 198-250); Oct. (1, 305); Nov. (1, 195); Dec. (1, 239).

Megalops atlantica Valenciennes. Tarpon. None captured.

Family CLUPEIDAE

Alosa aestivalis (Mitchill). Blueback herring. Stations: C(7), L(2). Salinity 0-20.0, temperature 23.5-28.5. Number and length: April (1, 28); May (1, 39).

Alosa mediocris (Mitchill). Hickory shad. None captured.

Alosa sapidissima (Wilson). American shad. None captured.

Brevoortia smithi Hildebrand. Yellowfin menhaden. Stations: A(24); D(3). Salinity 10.3-18.3, temperature 11.7-24.0. Number and length: Jan. (2, 201-266); Sept. (15, 228-254).

Brevoortia tyrannus (Latrobe). Atlantic menhaden*. Stations:

A(25), C(13). Salinity 7.9-13.7, temperature 26.2-30.8. Number and length: Aug. (1, 123); Oct. (10, 69-74).

Dorosoma cepedianum (Lesueur). Gizzard shad. Stations: C(22), G(3), H(17, 37), I(5, 6, 8, 9, 12, 15, 20), J(3-7), K(4). Salinity 0, temperature 8.8-30.5. Number and length: Jan (4, 99-121); Feb. (2, 55-64); Mar. (1, 111); May (1, 287); June 2, 75-80); July (9, 25-157); Aug. (12, 90-272); Oct. (10, 31-234); Nov. (8, 115-220); Dec. (16, 68-237).

Dorosoma petenense (Günther). Threadfin shad. None captured.

Harengula pensacolatae Goode and Bean. Scaled sardine*. Stations: H(4, 33), I(3, 12), J(2). Salinity 0, temperature 26.0-30.2. Number and length: May (2, 23-27); June (103, 24-46).

Opisthonema oglinum (Lesueur). Atlantic thread herring*. Stations: A(15, 16, 22, 23), B(6), I(20). Salinity 0-26.8, temperature 8.8-30.0. Number and length: May (160, 21-53); Aug. (48, 73-121); Sept. (1, 59); Dec. (2, 73-81).

Undetermined Clupeidae. Stations: A(10, 14, 18, 20), C(7, 21, 25-28, 32-34), E(22-24, 27), I(4). Salinity 0-22.5, temperature 17.5-31.5. Number and length: Mar. (19, 25-125); Apr. (50, 22-97); May (58, 22-59); June (1, 61); July (45, 43-70); Aug. (46, 26-69).

Family ENGRAULIDAE

Anchoa hepsetus (Linnaeus). Striped anchovy. Stations: A(3, 12, 24, 25), B(6), C(3), D(2), E(3, 12). Salinity 7.9-22.1, temperature 19.8-30.8. Number and length: Apr. (1, 94); May (2, 37-45); June (23, 17-62); Sept. (2, 70-74); Oct. (2, 52-71); Dec. (1, 89).

Anchoa mitchilli (Valenciennes). Bay anchovy. Stations: A(2, 3, 7-9, 12, 14-22, 24, 25), B(6), C(1-9, 11-17, 19-22, 24-34, 36-39), E(3, 5-9, 11, 13-17, 21-29, 35, 37), F(1), G(1-3), H(4, 6-9, 11, 15, 19, 23, 27, 28, 33, 35, 37, 40), I(7-11, 14, 15, 20), J(5-7). Salinity 0-27.3, temperature 8.3-34.1. Number and length: Jan. (281, 21-60); Feb. (26, 31-75); Mar. (92, 29-71); Apr. (321, 40-78); May (658, 23-77); June (738, 19-73); July (897, 21-71); Aug. (1,501, 21-83); Sept. (153, 19-62); Oct. (3,189, 10-68); Nov. (119, 22-61); Dec. (63, 27-71).

Anchoa sp.* Station: E(11). Salinity 22.1, temperature 33.8.
Number and length: May (1, 37).

Family UMBRIDAE

Umbra pygmaea (DeKay). Eastern mudminnow. F

Family ESOCIDAE

Esox americanus Gmelin. Redfin pickerel. F

Esox niger Lesueur. Chain pickerel. F

Family SYNODONTIDAE

Synodus foetens (Linnaeus). Inshore lizardfish*. Stations:
A(1, 15-21, 24, 25), B(6), C(8-10, 29, 36), E(12-14, 28, 29, 35).
Salinity 0-26.8, temperature 13.0-34.1. Number and length: Feb.
(1, 99); May (13, 39-104); June (73, 36-118); July (26, 37-136);
Aug. (1, 49); Sept. (8, 22-63); Oct. (9, 45-83).

Family CYPRINIDAE

Hybopsis harperi (Fowler). Redeye chub. F

Notemigonus crysoleucas (Mitchill). Golden shiner. F

Notropis chalybaeus (Cope). Ironcolor shiner. F

Notropis cummingsae Myers. Dusky shiner. F

Notropis hypselopterus (Günther). Sailfin shiner. F

Notropis maculatus (Hay). Taillight shiner. F

Notropis petersoni Fowler. Coastal shiner. F

Notropis welaka Evermann and Kendall. Bluenose shiner. F

Opsopoeodus emilae Hay. Pugnose minnow. F

Family CATOSTOMIDAE

Erimyzon sucetta (Lacépède). Lake chubsucker. F

Family ARIDAE

Bagre marinus (Mitchill). Gafftopsail catfish. Station: D(3).
salinity 18.3, temperature 11.7. Number and length: Jan (1, 116).

Galeichthys felis (Linnaeus). Sea catfish. Stations: A(1, 6, 7),
C(12-14, 17, 25, 27), D(1), E(20). Salinity 10.2-25.8, temperature

11.0-31.0. Number and length: Apr. (7, 86-186); May (1, 112); Aug. (12, 74-187); Sept. (8, 59-103); Dec. (3, 81-91).

Family ICTALURIDAE

- Ictalurus brunneus* (Jordon). Snail bullhead. F
Ictalurus catus (Linnaeus). White catfish. F
Ictalurus natalis (Lesueur). Yellow bullhead. F
Ictalurus nebulosus (Lesueur). Brown bullhead. F
Ictalurus punctatus (Rafinesque). Channel catfish. F
Noturus gyrinus (Mitchill). Tadpole madtom. F
Noturus leptacanthus Jordan. Speckled madtom. F

Family ANGUILLIDAE

Anguilla rostrata (Lesueur). American eel. Stations: C(30), E(27, 28, 32, 35), G(1), H(1, 6-11, 14, 16, 18, 19, 22, 23, 25-28, 30-33, 35, 36, 38-40, 42), I(1, 7, 8, 21), J(5-6), K(2,4). Salinity 0-22.1, temperature 8.3-34.0. Number and length: Jan. (31, 52-533); Feb. (6, 155-635); Mar. (16, 136-508); Apr. (7, 115-495); May (10, 165-546); June (6, 118-508); July (11, 152-610); Aug. (12, 74-576); Sept. (2, 274-379); Oct. (9, 251-611); Nov. (10, 120-512); Dec. (10, 279-533).

Family BELONIDAE

Strongylura marina (Walbaum). Atlantic needlefish. Stations: A(17, 25), C(31), E(28, 30, 32), H(15, 17, 29), I(17). Salinity 0-24.7, temperature 22.2-30.5. Number and length: Apr. (13, 28-74); June (3, 136-198); July (5, 76-483); Aug. (6, 252-545); Sept. (2, 114-324); Oct. (1, 356).

Family CYPRINODONTIDAE

- Cyprinodon hubbsi* Carr. Lake Eustis minnow. F
Cyprinodon variegatus Lacépède. Sheepshead minnow. Station: E(30). Salinity 0, temperature 29.8. Number and length: July (2, 19).
Fundulus chrysotus (Günther). Golden topminnow. F
Fundulus cingulatus Valenciennes. Banded topminnow. F
Fundulus confluentus Goode and Bean. Marsh killifish. Stations: A(9), C(16). Salinity 8.8-10.8, temperature 13.0-18.0. Number and length: Feb. (5, 50-56); Nov. (10, 33-53).

Fundulus heteroclitus (Linnaeus). Mummichog. Stations: A(9, 21, 22, 25), C(16, 18, 21, 27-29, 31, 35, 37), E(22-25, 27-31, 33). Salinity 0-22.7, temperature 13.0-30.2. Number and length: Feb. (7, 50-57); Mar. (42, 6-64); Apr. (11, 54-66); May (52, 34-68); June (81, 24-93); July (48, 17-78); Aug. (6, 34-53); Sept. (2, 25-30); Oct. (6, 28-55); Nov. (15, 31-63); Dec. (25, 35-65).

Fundulus majalis (Walbaum). Striped killifish. Station: B(6). Salinity 15.8, temperature 30.0. Number and length: Sept. (2, 75-79).

Fundulus notti (Agassiz). Starhead topminnow. F

Fundulus seminolis Girard. Seminole killifish. F

Fundulus similis (Baird and Girard). Longnose killifish*. Stations: A(9), B(5, 6). Salinity 10.8-16.0, temperature 13.0-30.0. Number and length: Feb. (4, 60-62); Sept. (6, 22-56).

Jordanella floridae Goode and Bean. Flagfish. F

Leptolucania ommata (Jordan). Pygmy killifish. F

Lucania goodei Jordan. Bluefin killifish. F

Lucania parva (Baird and Girard). Rainwater killifish. Station: H(18, 20). Salinity 0, temperature 31.0-31.6. Number and length: Aug. (5, 22-30); Sept. (9, 29-43).

Family POECILIIDAE

Gambusia affinis (Baird and Girard). Mosquitofish. Stations: C(28, 29), H(17). Salinity 0-22.7, temperature 26.2-30.5. Number and length: May (19, 34-40); June (10, 31-43); Aug. (2, 42-43).

Heterandria formosa Agassiz. Least killifish. F

Poecilia latipinna (Lesueur). Sailfin molly. Stations: C(17), E(24). Salinity 12.0-13.9, temperature 12.0-20.3. Number and length: Apr. (1, 38); Dec. (1, 44).

Family GADIDAE

Urophycis floridanus (Bean and Dresel). Southern hake*. Station: A(8, 9). Salinity 7.7-10.8, temperature 11.0-13.0. Number and length: Feb. (9, 34-120).

Urophycis regius (Walbaum). Spotted hake*. Station: A(8, 9). Salinity 7.7-10.8, temperature 11.0-13.0. Number and length: Feb. (8, 36-121).

Family SYNGNATHIDAE

Oostethus lineatus (Kaup). Opossum pipefish. None captured.

Syngnathus fuscus Storer. Northern pipefish*. Station: E(7). Salinity 10.0, temperature 20.5. Number and length: Dec. (1, 108).

Syngnathus louisianae Günther. Chain pipefish. Stations: A(1, 15-17), C(15, 29, 36), E(11, 12, 35, 36). Salinity 0-26.8, temperature 20.0-33.8. Number and length: Apr. (1, 195); May (3, 115-298); June (5, 56-146); Sept. (6, 78-166); Oct. (6, 76-213).

Syngnathus scovelli (Evermann and Kendall). Gulf pipefish. Stations: A(1), C(6), E(9, 11, 22, 25, 37), H(15, 18, 20, 22), I(19), J(8), K(5). Salinity 0-22.1, temperature 12.2-33.8. Number and length: Feb. (2, 56-135); Mar. (13, 88-126); Apr. (4, 64-130); May (2, 70-141); July (2, 77-136); Aug. (5, 77-107); Sept. (3, 113-126); Nov. (5, 81-121); Dec. (6, 71-99).

Undetermined Syngnathidae. Stations: A(3, 14, 19, 25), C(30, 31, 34, 37, 38), E(2, 4, 27-30). Salinity 0-22.1, temperature 23.0-31.5. Number and length: Apr. (1, 68); May (2, 68-126); June (6, 69-156); July (9, 32-157); Aug. (8, 36-179); Oct. (14, 78-156).

Family APHREDODERIDAE

Aphredoderus sayanus (Gilliams). Pirate perch. F

Family CENTROPOMIDAE

Centropomus undecimalis (Bloch). Snook. None captured.

Family SERRANIDAE

Centropristes philadelphicus (Linnaeus). Rock sea bass*. Station: A(8). Salinity 7.7, temperature 11.0. Number and length: Feb. (2, 129-131).

Centropristes striatus (Linnaeus). Black sea bass*. Station: A(8, 11, 17, 19, 21, 26). Salinity 7.7-24.7, temperature 11.0-29.8. Number and length: Feb. (1, 91); Mar. (2, 101-122); June (1, 28); July (3, 38-71); Aug. (1, 176); Nov. (1, 176).

Mycteroperca microlepis (Goode and Bean). Gag*. Station: B(6). Salinity 15.8, temperature 30.0. Number and length: Sept. (1, 182).

Roccus saxatilis (Walbaum). Striped bass. Station: J(1). Salinity 0, temperature 22.0. Number and length: May (1, 46).

Family LUTJANIDAE

Lutjanus analis (Cuvier). Mutton snapper*. Station: E(12). Salinity 14.9, temperature 29.9. Number and length: June (1, 65).

Lutjanus griseus (Linnaeus). Gray snapper. Stations: A(25), C(35-37), E(8, 20, 35-37), H(42). Salinity 0-17.8, temperature 11.0-28.5. Number and length: Jan. (1, 67); Sept. (11, 19-54); Oct. (27, 24-58); Nov. (4, 40-58); Dec. (1, 105).

Family CENTRARCHIDAE

- Acantharchus pomotis* (Baird). Mud sunfish. F
Centrarchus macropterus (Lacépède). Flier. F
Chaenobryttus gulosus (Cuvier). Warmouth. F
Elassoma evergladei Jordan. Everglades pygmy sunfish. F
Elassoma okefenokee Böhlke. Okefenokee pygmy sunfish. F
Elassoma zonatum Jordan. Banded pygmy sunfish. F
Enneacanthus chaetodon (Baird). Blackbanded sunfish. F
Enneacanthus gloriosus (Holbrook). Bluespotted sunfish. F
Enneacanthus obesus (Girard). Banded sunfish. F
Lepomis auritus (Linnaeus). Redbreast sunfish. F
Lepomis macrochirus Rafinesque. Bluegill. F
Lepomis marginatus (Holbrook). Dollar sunfish. F
Lepomis microlophus (Günther). Redear sunfish. F
Lepomis punctatus (Valenciennes). Spotted sunfish. F
Micropterus salmoides (Lacépède). Largemouth bass. F
Pomoxis nigromaculatus (Lesueur). Black crappie. F

Family PERCIDAE

- Etheostoma fusiforme barratti* (Holbrook). Scalyhead darter. F
Etheostoma edwini (Hubbs and Cannon). Brown darter. F
Etheostoma nigrum Rafinesque. Johnny darter. F
Percina nigrofasciata (Agassiz). Blackbanded darter. F

Family CARANGIDAE

Caranx hippos (Linnaeus). Crevalle jack. Stations: A(25), B(7), C(28, 32), E(30). Salinity 0-19.6, temperature 26.2-30.0. Number and length: May (5, 33-54); July (5, 38-106); Oct. (1, 47).

Chloroscombrus chrysurus (Linnaeus). BUMPER. Stations: A(20, 22), B(6), C(2), E(7). Salinity 10.0-20.1, temperature 20.3-

30.0. Number and length: July (3, 22-52); Aug. (2, 61-67); Sept. (3, 44-48); Nov. (12, 48-65); Dec. (1, 105).

Oligoplites saurus (Bloch and Schneider). Leatherjacket*. Station: B(6). Salinity 15.8, temperature 30.0. Number and length: Sept. (1, 55).

Selene vomer (Linnaeus). Lookdown*. Stations: A(19), E(29, 32, 35). Salinity 6.2-14.5, temperature 24.8-29.3. Number and length: June (1, 59); July (6, 27-76); Oct. (1, 83).

Trachinotus falcatus (Linnaeus). Permit*. Station: E(31). Salinity 10.5, temperature 30.2. Number and length: July (1, 50).

Vomer setapinnis (Mitchill). Atlantic moonfish*. Station: A(20). Salinity 14.5, temperature 29.2. Number and length: July (1, 38).

Family GERRIDAE

Diapterus olisthostomus (Goode and Bean). Irish pompano. Station: C(32, 34-36). Salinity 0-7.6, temperature 25.4-31.5. Number and length: July (2, 26-40); Aug. (2, 40-68); Sept. (16, 24-78).

Diapterus plumieri (Cuvier). Striped mojarra*. Station: C(13, 15). Salinity 11.1-13.7, temperature 21.0-30.8. Number and length: Aug. (2, 71-73); Oct. (3, 63-76).

Eucinostomus argenteus Baird and Girard. Spotfin mojarra. Stations: A(20-22, 24, 25), B(6), C(1, 13, 15, 16, 32, 34, 36, 39), E(11, 12, 14, 17, 18, 31, 32, 36, 37), H(17, 19), I(6, 7). Salinity 0-22.1, temperature 16.5-34.0. Number and length: May (1, 26); June (2, 30-47); July (36, 36-85); Aug. (13, 28-98); Sept. (15, 22-104); Oct. (61, 16-115); Nov. (134, 15-111); Dec. (2, 45-52).

Eucinostomus gula (Quoy and Gaimard). Silver Jenny*. Stations: A(20-22), B(6), C(10), E(13, 31). Salinity 10.5-20.1, temperature 29.2-34.1. Number and length: July (16, 46-83); Aug. (6, 78-100); Sept. (2, 91-103).

Undetermined Gerridae. Stations: A(18, 19), C(2, 3, 37, 38), E(6, 29, 30, 33-35). Salinity 0-22.5, temperature 19.8-31.0. Number and length: June (41, 36-58); July (66, 46-69); Aug. (19, 79-95); Oct. (37, 22-102); Nov. (12, 46-73); Dec. (8, 44-73).

Family POMADASYIDAE

Orthopristis chrysopterus (Linnaeus). Pigfish. Stations: A(15-

17, 24), C(8), E(11-14, 16, 27, 32, 34, 35), H(15). Salinity 0-26.8, temperature 23.5-34.1. Number and length: May (74, 17-54); June (4, 39-69); July (19, 67-97); Aug. (3, 82-113); Sept. (1, 142); Oct. (2, 115-118).

Family SCIAENIDAE

Bairdiella chrysura (Lacépède). Silver perch. Stations: A(2, 3, 7, 9-11, 16-19), C(2, 10, 11, 13, 14, 16, 29, 32, 38), D(3), E(3, 5, 6, 13, 15, 22, 23, 28-30, 34), H(15, 17-20, 37). Salinity 0-27.3, temperature 11.7-34.1. Number and length: Jan. (1, 142); Feb. (1, 81); Mar. (13, 104-137); May (10, 46-100); June (117, 22-97); July (131, 45-124); Aug. (25, 71-122); Sept. (6, 83-91); Oct. (2, 135-141); Nov. (3, 74-91).

Cynoscion nebulosus (Cuvier). Spotted seatrout. Stations: C(15, 32, 34-38), E(18, 22, 35, 36), H(17). Salinity 0-11.1, temperature 19.5-31.5. Number and length: Mar. (3, 97-118); July (4, 64-84); Aug. (13, 13-136); Sept. (56, 15-128); Oct. (87, 19-173).

Cynoscion regalis (Bloch and Schneider). Weakfish*. Stations: A(3, 15), B(4), C(9, 13), E(3). Salinity 13.7-26.8, temperature 23.5-30.8. Number and length: May (2, 31-32); June (13, 23-65); Aug. (5, 143-206).

Leiostomus xanthurus Lacépède. Spot. Stations: A(2, 3, 8, 10-12, 14, 18, 19, 21), C(1-3, 6-11, 13-15, 21-29, 31, 33-38), D(3), E(1, 6, 10, 12-16, 19, 22-31, 33-37), G(1, 2), H(2-4, 6, 10-12, 14-16, 21, 30), I(1-3, 10-12), K(2). Salinity 0-27.3, temperature 11.0-34.1. Number and length: Jan. (9, 124-158); Feb. (508, 20-188); Mar. (2, 186, 17-164); Apr. (1,250, 16-178); May (823, 38-160); June (504, 40-138); July (255, 57-115); Aug. (60, 68-157); Sept. (15, 96-137); Oct. (26, 97-185); Nov. (15, 105-136); Dec. (2, 129-130).

Menticirrhus americanus (Linnaeus). Southern kingfish*. Station: E(35). Salinity 6.2, temperature 24.8. Number and length: Oct. (4, 28-44).

Micropogon undulatus (Linnaeus). Atlantic croaker. Stations: A(1-3, 8-12, 14-16, 18), B(2), C(2-14, 16-22, 24-30, 32-35, 39), D(3), E(1, 3, 6, 9-14, 16, 17, 19-25, 27-29, 31, 33, 37), F(1), G(1-3), H(2-14, 16, 19, 20, 22, 23, 25-38, 40-42), I(1-16, 19-21), J(2, 6, 7), K(3-5), L(1). Salinity 0-30.2, temperature 8.3-34.1. Number and length: Jan. (368, 16-105); Feb. (388, 5-147); Mar. (1,858, 16-162); Apr. (1,711, 17-155); May (1, 110, 16-182); June (1,499, 24-

145); July (395, 59-162); Aug. (268, 78-171); Sept. (13, 123-154); Oct. (92, 27-175); Nov. (220, 11-162); Dec. (392, 17-151).

Pogonias cromis (Linnaeus). Black drum. Stations: A(16), C(4, 17, 22, 26, 27). Salinity 0-24.5, temperature 12.0-27.0. Number and length: Jan. (1, 194); Mar. (2, 181-184); Apr. (1, 194); May (4, 178-203); Dec. (3, 174-195).

Sciaenops ocellata (Linnaeus). Red drum. Stations: A(20), C(29, 39), E(25, 27, 28, 37), H(31). Salinity 0-22.7, temperature 16.5-29.2. Number and length: Apr. (6, 106-129); May (3, 116-164); June (11, 110-160); July (1, 249); Nov. (6, 31-70).

Stellifer lanceolatus (Holbrook). Star drum*. Stations: A(7), C(36), E(3, 20). Salinity 0-15.8, temperature 11.0-30.8. Number and length: June (3, 94-95); Sept. (24, 12-150); Dec. (1, 77).

Family SPARIDAE

Archosargus probatocephalus (Walbaum). Sheepshead. Stations A(8, 12, 15-18, 20-22, 24, 25), C(14), E(6, 11, 13, 18, 24, 28), H(12, 15, 31). Salinity 0-26.8, temperature 11.0-34.1. Number and length: Feb. (1, 95); Apr. (8, 75-258); May (7, 26-181); June (3, 136-190); July (4, 59-166); Aug. (3, 166-194); Sept. (2, 106-195); Oct. (4, 98-216); Nov. (1, 190).

Lagodon rhomboides (Linnaeus). Pinfish. Stations: A(8, 10, 12-14, 16, 19, 20, 25), B(6), C(8-11, 13, 15, 22, 30-32, 34, 38), D(3), E(11-18, 22-33, 35, 37), H(15, 17, 20). Salinity 0-25.0, temperature 11.0-34.1. Number and length: Jan. (1, 94); Feb. (1, 127); Mar. (14, 102-141); Apr. (14, 21-121); May (27, 22-157); June (32, 44-153); July (117, 43-159); Aug. (22, 73-170); Sept. (11, 104-146); Oct. (23, 72-203); Nov. (2, 100-109).

Family EPHIPPIDAE

Chaetodipterus faber (Broussonet). Atlantic spadefish*. Stations: A(3, 21), E(11, 13, 32, 36). Salinity 0-22.1, temperature 25.3-34.1. Number and length: May (2, 15-28); June (1, 98); July (2, 43-58); Aug. (1, 32); Oct. (1, 24).

Family TRICHIURIDAE

Trichiurus lepturus Linnaeus. Atlantic cutlassfish*. Stations: B(3), C(1, 2). Salinity 13.4-23.7, temperature 20.3-28.5. Number and length: June (3, 330-406); Oct. (1, 134); Nov. (1, 325).

Family SCOMBRIDAE

Scomberomorus maculatus (Mitchill). Spanish mackerel*. Stations: A(18), B(6). Salinity 15.8-22.5, temperature 28.7-30.0. Number and length: June (1, 108); Sept. (1, 58).

Family ELEOTRIDAE

Dormitator maculatus (Bloch). Fat sleeper. Station: H(18). Salinity 0, temperature 31.6. Number and length: Aug. (5, 97-126).

Eleotris picta Kner and Steindachner. Spotted sleeper*. F

Family GOBIDAE

Awaous tajasica (Lichtenstein). River goby. None captured.

Bathygobius soporator (Valenciennes). Frillfin goby. None captured.

Gobioides broussoneti Lacépède. Violet goby*. Stations: B(3, 5), C(22), F(1), G(2). Salinity 0-23.7, temperature 16.8-32.4. Number and length: Mar. (1, 597); May (2, 185-200); June (1, 502); Sept. (3, 381-572).

Gobionellus boleosoma (Jordan and Gilbert). Darter goby. Stations: A(8, 11, 14, 20-22, 25), B(6), C(15-17, 36, 39), E(17, 20, 21, 26, 27, 29, 34-37), H(20). Salinity 0-20.1, temperature 11.0-31.0. Number and length: Jan. (1, 32); Feb. (1, 37); Mar. (5, 20-39); Apr. (5, 32-44); May (3, 42-49); June (1, 43); July (11, 26-37); Aug. (5, 14-39); Sept. (9, 15-36); Oct. (10, 19-38); Nov. (17, 18-40); Dec. (3, 24-28).

Gobionellus gracillimus Ginsburg. Slim goby*. Station: C(29). Salinity 22.7, temperature 26.4. Number and length: June (2, 129-159).

Gobionellus hastatus Girard. Sharptail goby*. Stations: C(17, 35), E(14, 20). Salinity 4.0-12.0, temperature 11.0-30.0. Number and length: July (1, 218); Sept. (1, 84); Dec. (2, 91-178).

Gobionellus shufeldti (Jordan and Evermann). Freshwater goby. Stations: A(10), C(10, 13, 17, 21-27, 31, 34, 36, 37), E(1, 2, 10, 22-26, 30, 37), G(1), H(18, 25, 27, 29), I(7-9, 19). Salinity 0-21.3, temperature 12.0-31.6. Number and length: Jan. (2, 39-91); Feb. (1, 67); Mar. (151, 28-74); Apr. (60, 28-77); May (11, 31-61);

July (3, 44-73); Aug. (8, 24-41); Sept. (5, 15-33); Oct. (1, 59); Nov. (21, 35-92); Dec. (11, 40-66).

Gobionellus smaragdus (Valenciennes). Emerald goby*. Station: E(13). Salinity 15.3, temperature 34.1. Number and length: July (1, 57).

Gobiosoma bosc (Lacépède). Naked goby. Stations: A(8, 11, 14, 15), C(3, 16, 24, 28, 31, 35-38), E(12, 22-24, 28, 30-32, 34-37), H(7, 9, 10, 20, 29, 33, 36, 40, 42), I(15). Salinity 0-26.8, temperature 11.0-31.0. Number and length: Jan. (91, 15-40); Feb. (7, 20-37); Mar. (13, 33-50); Apr. (15, 24-42); May (2, 32-38); June (3, 29-34); July (7, 13-41); Aug. (10, 14-26); Sept. (38, 12-32); Oct. (542, 14-47); Nov. (113, 16-33); Dec. (1, 20).

Gobiosoma robustum Ginsberg. Code goby*. Stations: E(14), H(25). Salinity 0-11.0, temperature 14.0-30.0. Number and length: Jan. (4, 20-23); July (1, 26).

Microgobius gulosus (Girard). Clown goby. Stations: C(9, 34, 36-38), E(12, 13, 35-37), F(1), H(4-9, 12, 19, 20, 22, 25, 29, 31, 41, 42), I(1, 4, 6, 7, 9-11, 13, 15, 16, 18, 19, 21), J(3-6, 8), K(1, 4, 5). Salinity 0-19.9, temperature 12.0-34.1. Number and length: Jan. (26, 28-52); Feb. (3, 43-49); Mar. (11, 47-62); Apr. (14, 25-65); May (4, 17-61); June (5, 23-62); July (2, 35-60); Aug. (18, 17-45); Sept. (13, 22-47); Oct. (85, 11-54); Nov. (92, 14-61); Dec. (80, 13-56).

Microgobius thalassinus (Jordan and Gilbert). Green goby*. Stations: A(15, 20, 25), C(13, 15, 24, 36, 37), E(12, 14, 30, 32, 35-37). Salinity 0-26.8, temperature 16.5-30.8. Number and length: Mar. (1, 43); May (2, 46-47); June (4, 23-35); July (12, 24-42); Aug. (1, 32); Sept. (2, 19-21); Oct. (12, 27-42); Nov. (16, 30-36).

Family TRIGLIDAE

Prionotus scitulus Jordan and Gilbert. Leopard searobin*. Station: A(17, 18, 24, 25). Salinity 7.9-24.7, temperature 24.0-28.7. Number and length: June (9, 43-63); Sept. (7, 22-43); Oct. (9, 26-58).

Prionotus tribulus Cuvier. Bighead searobin*. Stations: A(3, 8, 11, 12, 15, 19, 20), C(6, 8, 15, 26, 35, 36, 39), E(19, 21, 32). Salinity 0-26.8, temperature 11.0-29.5. Number and length: Jan. (1, 68); Feb. (5, 61-88); Mar. (8, 19-93); Apr. (2, 28-71); May (2, 38-

67); June (1, 32); July (3, 32-36); Sept. (5, 37-72); Oct. (1, 39); Nov. (2, 46-47).

Family URANOSCOPIDAE

Astroscopus y-graecum (Cuvier). Southern stargazer*. Stations: A(11), D(3). Salinity 11.4-18.3, temperature 11.7-18.5. Number and length: Jan. (1, 65); Mar. (2, 45-55).

Family BLENNIIDAE

Chasmodes bosquianus (Lacépède). Striped blenny*. Stations: A(9), E(13). Salinity 10.8-15.3, temperature 13.0-34.1. Number and length: Feb. (2, 51-63); July (1, 39).

Hypsoblennius hentzi (Lesueur). Feather blenny*. Station: A(11, 17). Salinity 11.4-24.7, temperature 18.5-26.6. Number and length: Mar. (3, 56-66); June (1, 65).

Hypsoblennius ionthas (Jordan and Gilbert). Freckled blenny*. Station: A(17). Salinity 24.7, temperature 26.6. Number and length: June (1, 36).

Undetermined *Hypsoblennius*. Station: A(16, 19, 21, 24-26). Salinity 7.9-23.1, temperature 17.4-29.8. Number and length: May (1, 62); July (1, 53); Aug. (1, 40); Sept. (3, 62-72); Oct. (2, 22-52); Nov. (2, 61-62).

Family OPHIDIIDAE

Ophidion welshi (Nichols and Breder). Crested cusk-eel*. Station: A(2, 5). Salinity 20.8-27.3, temperature 21.5-25.2. Number and length: Mar. (9, 69-179); May (3, 128-145).

Family STROMATEIDAE

Peprilus alepidotus (Linnaeus). Southern harvestfish*. Stations: B(5), D(3). Salinity 16.0-18.3, temperature 11.7-28.3. Number and length: Jan. (2, 81-90); Sept. (1, 96).

Family SPHYRAENIDAE

Sphyraena barracuda (Walbaum). Great barracuda*. Station: A(20). Salinity 14.5, temperature 29.2. Number and length: July (1, 41).

Family MUGILIDAE

Agnonostomus monticola (Bancroft). Mountain mullet. None captured.

Mugil cephalus Linnaeus. Striped mullet. Stations: A(10, 12, 17, 18, 23, 25, 26), B(6), C(13, 18, 26, 29, 32-34), E(22, 24, 28-32, 36), H(17, 20, 29). Salinity 0-25.2, temperature 13.0-31.5. Number and length: Mar. (23, 24-166); Apr. (31, 22-330); June (69, 32-254); July (14, 76-330); Aug. (8, 122-381); Sept. (2, 131-159); Oct. (3, 117-164); Nov. (6, 145-155); Dec. (13, 24-229).

Mugil curema Valenciennes. White mullet. Stations: A(19, 21), B(6), C(15, 16, 21, 31, 33-35), E(19, 22, 28-31, 33-35, 37), H(17, 20), I(17). Salinity 0-22.1, temperature 16.5-31.5. Number and length: Mar. (22, 22-139); June (56, 45-167); July (83, 48-92); Aug. (24, 75-169); Sept. (14, 93-130); Oct. (9, 113-125); Nov. (13, 108-170).

Family ATHERINIDAE

Labidesthes sicculus (Cope). Brook silverside. F

Membras martinica (Valenciennes). Rough silverside. Station: A(25). Salinity 7.9, temperature 26.2. Number and length: Oct. (25, 32-75).

Menidia beryllina (Cope). Tidewater silverside. Stations: A(16-19), C(15, 18, 28, 31, 32, 35-39), E(27, 28, 30, 31, 33), G(3), H(3, 4, 8, 18, 20), I(2, 3, 6, 17), J(2-6, 8), K(3), L(3). Salinity 0-24.7, temperature 12.0-31.6. Number and length: Jan. (1, 45); May (51, 25-42); June (363, 18-53); July (71, 38-57); Aug. (6, 38-56); Sept. (38, 19-52); Oct. (28, 23-42); Nov. (8, 27-49); Dec. (13, 21-54).

Menidia menidia (Linnaeus). Atlantic silverside. Stations: A(10-12, 15, 20-22, 24-26), C(26, 34, 36), E(35, 36). Salinity 0-26.8, temperature 17.4-31.5. Number and length: Mar. (100, 65-96); Apr. (54, 57-96); May (3, 69-79); July (50, 55-65); Aug. (520, 38-59); Sept. (21, 54-63); Oct. (40, 32-71); Nov. (17, 37-72).

Family BOTHIDAE

Ancylosetta quadrocellata Gill. Ocellated flounder*. Station: A(6, 8, 11). Salinity 7.7-25.8, temperature 11.0-19.3. Number and length: Feb. (4, 55-67); Mar. (1, 85); Apr. (3, 34-59).

Citharichthys spilopterus Günther. Bay whiff. Stations: A(15-17, 19, 20), B(6), C(2, 7-9, 11-15, 25, 27-29, 33-35, 39), E(3, 11-18, 28, 30, 32, 34-37), H(5, 19, 40), I(2). Salinity 0-26.8, temperature 16.5-34.1. Number and length: Apr. (3, 38-86); May (45, 26-93); June, (90, 31-97); July (45, 38-121); Aug. (35, 41-125); Sept. (14, 97-126); Oct. (8, 26-124); Nov. (5, 51-62).

Etropus crossotus Jordan and Gilbert. Fringed flounder*. Stations: A(8, 9, 17, 24-26), B(1, 6), E(14). Salinity 7.7-28.0, temperature 11.0-30.0. Number and length: Feb. (2, 69-72); Mar. (1, 89); June (3, 35-42); July (1, 78); Sept. (4, 33-88); Oct. (6, 28-89); Nov. (1, 56).

Paralichthys albigutta Jordan and Gilbert. Gulf flounder. Stations: A(8, 16, 17), C(6, 16), E(17). Salinity 7.7-24.7, temperature 11.0-30.8. Number and length: Feb. (5, 127-168); Mar. (2, 51-57); May (1, 71); June (3, 66-68); Sept. (1, 139); Nov. (1, 159).

Paralichthys dentatus (Linnaeus). Summer flounder*. Stations: A(15), C(7). Salinity 20.0-26.8, temperature 23.5. Number and length: Apr. (1, 73); May (2, 65-86).

Paralichthys lethostigma Jordan and Gilbert. Southern flounder. Stations: A(9, 21, 22), B(2), C(6, 8, 14, 16, 17, 21, 29, 30, 35, 39), E(10, 12, 18), G(2), H(3, 20, 29, 38), I(2). Salinity 0-30.2, temperature 12.0-31.0. Number and length: Feb. (1, 311); Mar. (19, 22-56); Apr. (6, 40-78); May (6, 67-155); June (43, 61-145); Aug. (3, 257-503); Sept. (6, 106-201); Oct. (1, 139); Nov. (3, 112-202); Dec. (6, 129-144).

Undetermined *Paralichthys*. Stations: A(1, 3, 10-12, 15, 18-20), C(10-13, 21-28, 30-32, 36-38), E(13-15, 22-25, 27, 32, 34), H(4, 19, 25, 30, 32, 33, 37, 41), I(4, 12, 13). Salinity 0-26.8, temperature 14.0-34.1. Number and length: Jan. (1, 210); Mar. (126, 15-254); Apr. (104, 32-178); May (43, 25-362); June (9, 71-240); July (27, 54-231); Aug. (13, 89-356); Sept. (3, 106-191); Oct. (4, 110-164).

Scophthalmus aquosus (Mitchill). Windowpane*. Station: E(19). Salinity 5.5, temperature 19.4. Number and length: Nov. (1, 122).

Family SOLEIDAE

Achirus lineatus (Linnaeus). Lined sole*. Stations: A(15), C(15, 21), E(20). Salinity 0-26.8, temperature 11.0-23.5. Number and length: Mar. (1, 96); May (1, 31); Oct. (1, 77); Dec. (1, 92).

Trinectes maculatus (Bloch and Schneider). Hogchoker. Stations: A(1-5, 8, 11), C(9, 10, 25, 34, 36, 37), D(3), E(1, 2, 13, 14, 22, 35-37), F(1), G(2, 3), H(1, 2, 4-14, 16, 18-22, 25-42), I(1-16, 18-21), J(1-8), K(1-5), L(1-3). Salinity 0-28.2, temperature 8.8-34.1. Number and length: Jan. (116, 26-108); Feb. (90, 27-128); Mar. (785, 16-172); Apr. (230, 25-112); May (170, 36-114); June (220, 15-122); July (140, 16-118); Aug. (189, 17-123); Sept. (70, 15-103); Oct. (366, 17-140); Nov. (240, 28-135); Dec. (231, 25-121).

Family CYNOGLOSSIDAE

Symphurus plagiusa (Linnaeus). Blackcheek tonguefish. Stations: A(1, 8-12, 15-22, 24-26), B(6), C(2, 9-11, 14, 16, 17, 21, 25, 27, 29-39), D(3), E(10, 13-15, 22, 24, 25, 28, 30-32, 34-37). Salinity 0-26.8, temperature 11.0-34.1. Number and length: Jan. (8, 32-81); Feb. (21, 44-106); Mar. (50, 31-88); Apr. (7, 32-115); May (4, 25-77); June (20, 19-81); July (47, 19-68); Aug. (35, 11-76); Sept. (55, 18-92); Oct. (91, 18-84); Nov. (28, 22-152); Dec. (3, 33-37).

Family GOBIESOCIDAE

Gobiesox strumosus Cope. Skilletfish*. Stations: A(8), C(21), E(19). Salinity 0-7.7, temperature 11.0-19.4. Number and length: Feb. (1, 40); Mar. (1, 40); Nov. (1, 38).

Family BALISTIDAE

Stephanolepis hispidus (Linnaeus). Planehead filefish*. Stations: A(15-18), C(27, 29), E(3, 11-14, 26-29). Salinity 11.0-26.8, temperature 22.8-34.1. Number and length: May (12, 17-60); June (14, 21-59); July (3, 65-70).

Family TETRAODONTIDAE

Sphaeroides maculatus (Bloch and Schneider). Northern puffer*. Stations: A(16-19), C(10, 26, 29), E(12, 13, 28, 32, 33). Salinity 6.7-24.7, temperature 23.0-34.1. Number and length: Apr. (1, 16); May (1, 19); June (25, 18-56); July (4, 42-64); Aug. (1, 40).

Family DIODONTIDAE

Chilomycterus schoepfi (Walbaum). Striped burrfish*. Stations: C(15), E(3, 4). Salinity 11.1-14.3, temperature 21.0-30.8. Number and length: June (1, 23); Aug. (1, 101); Oct. (1, 39).

Family BATRACHOIDIDAE

Opsanus tau (Linnaeus). Oyster toadfish. Stations: A(1, 11, 14, 17, 19-21, 24-26), B(6), C(19), E(6, 18, 24, 30, 32, 33). Salinity 0-24.7, temperature 14.0-30.0. Number and length: Jan. (1, 51); Mar. (3, 133-233); Apr. (4, 130-161); June (2, 118-172); July (22, 18-289); Aug. (3, 26-163); Sept. (2, 135-229); Oct. (4, 89-205); Nov. (7, 88-205).

Family OGCOEPHALIDAE

Ogcocephalus cubifrons (Richardson). Shortnose batfish. None captured.

ACKNOWLEDGMENTS

Dr. Carter R. Gilbert, Assistant Curator in charge of fishes, the Florida State Museum, Gainesville, identified representative specimens from almost all of the collections, read the manuscript, and offered helpful suggestions on treatment of the data. Dr. William M. McLane, Florida Aquatic Nurseries, Ltd., Ft. Lauderdale, generously allowed me to include the records from his unpublished dissertation on the fishes of the St. Johns River. Martin A. Roessler, University of Miami, identified the fine-scaled species of *Gobionellus*.

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Quart. Jour. Florida Acad. Sci. 30(1) 1967 (1968)